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1. INTRODUCTION

What is Artificial Intelligence?

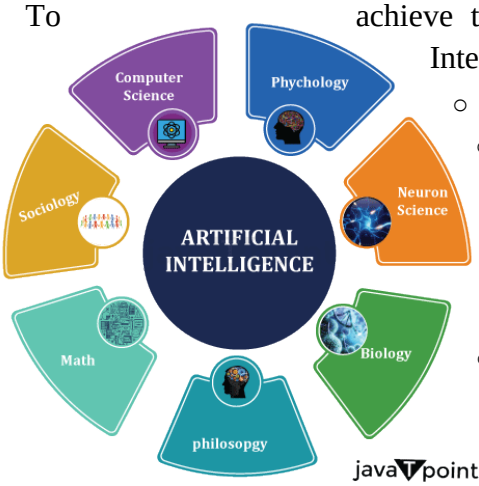
Artificial intelligence (AI) is a branch of computer science which focus on creating intelligent machines capable of mimicking human cognitive functions like learning and problem-solving. It's a broad field encompassing various techniques. Artificial Intelligence is a method of making a computer, a computer-controlled robot, or a software think intelligently like the human mind. AI is accomplished by studying the patterns of the human brain and by analyzing the cognitive process. The outcome of these studies develops intelligent software and systems. Artificial Intelligence (AI) is rapidly transforming our world. The power of AI is visible in its evolution phase, while the maturity phase is still a long journey.

What Comprises to Artificial Intelligence?

Artificial Intelligence is not just a part of computer science even it's so vast and requires lots of other factors which can contribute to it. To create the AI first we should know that how intelligence is composed, so the Intelligence is an intangible part of our brain which is a combination of **Reasoning, learning, problem-solving perception, language understanding, etc**.

To achieve the above factors for a machine or software Artificial Intelligence requires the following discipline:

- Mathematics
- Biology
- Psychology
- Sociology
- Computer Science
- Neurons Study
- Statistics



Different fields under AI

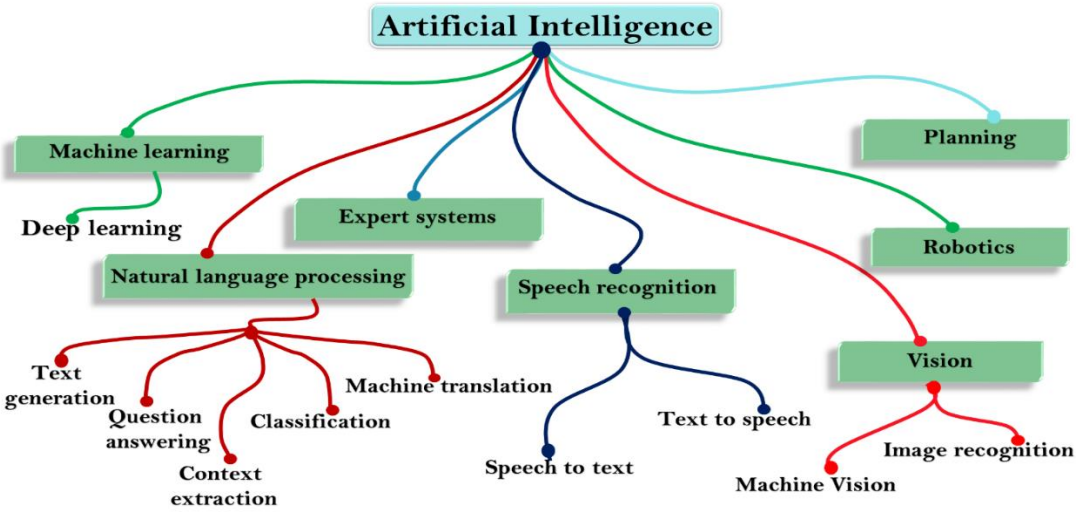
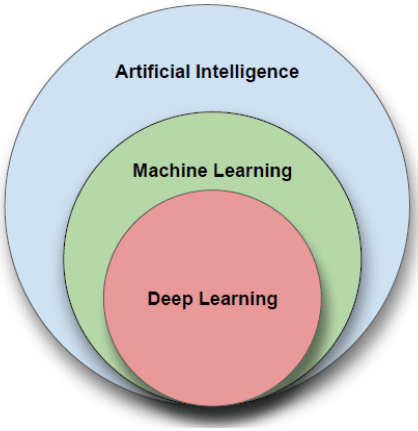


Image source: javatpoint.com/subsets-of-ai

Artificial Intelligence is the most trending field of computer science. However, with all the new technology and research, it's growing so fast that it can be confusing to understand what is what. AI can be broken down into two major fields, Machine Learning (ML) and Neural Networks (NN). Both are subfields under Artificial Intelligence, and each one has its methods and algorithms to help solve problems.



Machine learning

Machine Learning (ML) makes computers learn from data and experience to improve their performance on some tasks or decision-making processes. ML uses statistics and probability theory for this purpose. Machine learning uses algorithms to break down data, learn from it, and make determinations without explicit programming. Machine learning algorithms are often categorized as supervised or unsupervised. Supervised algorithms can apply what has been learned in the past to new data sets; unsupervised algorithms can draw inferences from datasets. Machine learning algorithms are designed to strive to establish linear and non-linear relationships in a given set of data. This feat is achieved by statistical methods used to train the algorithm to classify or predict from a dataset.

Deep learning

Deep learning is a subset of machine learning that uses multi-layered artificial neural networks to deliver state-of-the-art accuracy in object detection, speech recognition and language translation. Deep learning is a crucial technology behind driverless cars and enables the machine analysis of large amounts of complex data — for example, recognizing the faces of people who appear in an image or video.

Neural networks

Neural networks are inspired by biological neurons in the human brain and are composed of layers of connected nodes called "neurons" that contain mathematical functions to process incoming data and predict an output value. Artificial neural network learns by example, similarly to how humans learn from our parents, teachers, and peers. They consist of at least three layers: an input layer, hidden layers, and an output layer. Each layer contains nodes (also known as neurons) which have weighted inputs that compute the output.

The performance of traditional machine learning models plateau and throwing any more data doesn't help improve the performance. Deep learning models continue to improve in performance with more data.

These fields have different algorithms, depending on the use case. However, classifying AI according to its strength and capabilities would mean further subdividing it into "narrow AI" and "general AI." Narrow AI is about getting machines to do one task really well, like image recognition or playing chess. General AI means devices that can do everything humans can do and more. Today's research focuses on narrow AI, but many researchers would like machine learning to eventually achieve general AI.

History of Artificial Intelligence (AI)

- Throughout history, people have been intrigued by the idea of making non-living things smart. In ancient times, Greek stories mentioned gods creating clever machines, and in Egypt, engineers made statues move. Thinkers like Aristotle and Ramon Llull laid the groundwork for AI by describing how human thinking works using symbols.
- In the late 1800s and early 1900s, modern computing started to take shape. Charles Babbage and Ada Lovelace designed machines that could be programmed in the 1830s. In the 1940s, John Von Neumann came up with the idea of storing computer programs. At the same time, Warren McCulloch and Walter Pitts started building the basics of neural networks.
- The 1950s brought us modern computers, letting scientists dig into machine intelligence. Alan Turing's Turing test became a big deal in computer smarts. The term "artificial intelligence" was first used in a 1956 Dartmouth College meeting, where they introduced the first AI program, the Logic Theorist.
- The following years had good times and bad times for AI, called "AI Winters." In the 1970s and 1980s, we hit limits with computer power and complexity. But in the late 1990s, things got exciting again. Computers were faster, and there was more data. IBM's Deep Blue beating chess champion Garry Kasparov in 1997 was a big moment.
- The 2000s started a new era with machine learning, language processing, and computer vision. This led to cool new products and services. The 2010s saw AI take off with things like voice assistants and self-driving cars. Generative AI, which makes creative stuff, also started getting big.
- In 2016 Hanson Robotics created a humanoid robot named Sophia, who became known as the first “robot citizen” and was the first robot created with a realistic human appearance and the ability to see and replicate emotions, as well as to communicate.
- In the 2020s, generative AI like ChatGPT-3 and Google's Bard grabbed everyone's attention. These models can create all sorts of new things when you give them a prompt, like essays or art. But remember, this tech is still new, and there are things to fix, like making sure it doesn't make things up.
- In the 2021 OpenAI developed DALL-E, which can process and understand images enough to produce accurate captions, moving AI one step closer to understanding the visual world.
- In November 2022, OpenAI launched ChatGPT, offering a chat-oriented interface to its GPT-3.5 LLM.

Types of Artificial Intelligence (AI)

1. **Narrow AI (Weak AI):** This form of AI is designed and trained for specific tasks or domains, such as speech recognition, image classification, or recommendation systems. Narrow AI excels within defined parameters but lacks general human-like intelligence.
2. **General AI (Strong AI)**: General AI aims to exhibit human-like intelligence and cognitive abilities across a wide range of tasks. This form of AI is hypothetical and remains a long-term goal of AI research.
3. **Machine Learning**: Machine learning is a subset of AI that focuses on enabling machines to learn from data and improve their performance without being explicitly programmed. It includes techniques like supervised learning, unsupervised learning, and reinforcement learning.

4. **Natural Language Processing (NLP)**: NLP enables machines to understand, interpret, and generate human language. Applications range from Chatbot and translation services to sentiment analysis and text summarization.
5. **Computer Vision**: Computer vision enables machines to interpret and understand visual information from the world. It is used in image and video recognition, object detection, autonomous vehicles, and medical image analysis.
6. **Robotics**: Robotics combines AI with mechanical engineering to create machines (robots) that can perform physical tasks autonomously or semi-autonomously. Applications include industrial automation, healthcare assistance, and exploration in hazardous environments.
7. **Expert Systems**: Expert systems are AI systems designed to emulate the decision-making ability of a human expert in a specific domain. They use knowledge bases and inference engines to provide advice or solve problems within their area of expertise.

What is a Chatbot?

A Chatbot is a software or computer program that simulates human conversation or chatter through text or voice interactions.

Users in both business-to-consumer (B2C) and business-to-business (B2B) environments increasingly use Chatbot virtual assistants to handle simple tasks. Adding Chatbot assistants reduces overhead costs, better utilizes support staff time and enables organizations to provide customer service around the clock.

Chatbot range from simplistic models that operate off of scripts to provide quick responses to specific questions, to artificial intelligence (AI) and machine learning (ML) models that can converse with users and complete more complex tasks. Chatbot also simulate human conversation in either written or spoken form.

Driven by AI, automated rules, natural-language processing (NLP), and machine learning (ML), Chatbot process data to deliver responses to requests of all kinds.

How Chatbot have evolved?

The origin of the Chatbot arguably lies with Alan Turing's 1950s vision of intelligent machines. Artificial intelligence, the foundation for Chatbot, has progressed since that time to include super intelligent supercomputers such as IBM Watson.

The original Chatbot was the phone tree, which led phone-in customers on an often cumbersome and frustrating path of selecting one option after another to wind their way through an automated customer service model. Enhancements in technology and the growing sophistication of AI, ML, and NLP evolved this model into pop-up, live, onscreen chats. And the evolutionary journey has continued.

With today's digital assistants, businesses can scale AI to provide much more convenient and effective interactions between companies and customers—directly from customers' digital devices.

Types of Chatbot

As Chatbot are still a relatively new business technology, debate surrounds how many different types of Chatbot exist and what the industry should call them. There are two main types of Chatbot.

- **Task-oriented (declarative) Chatbot** are single-purpose programs that focus on performing one function. Using rules, NLP, and very little ML, they generate automated but conversational responses to user inquiries. Interactions with these Chatbot are highly specific and structured and are most applicable to support and service functions—think robust, interactive FAQs. Task-oriented Chatbot can handle common questions, such as queries about hours of business or simple transactions that don't involve a variety of variables. Though they do use NLP so end users can experience them in a conversational way, their capabilities are fairly basic. These are currently the most commonly used Chatbot.

- **Data-driven and predictive (conversational) Chatbot** are often referred to as virtual assistants or digital assistants, and they are much more sophisticated, interactive, and personalized than task-oriented Chatbot. These Chatbot are contextually aware and leverage natural-language understanding (NLU), NLP, and ML to learn as they go. They apply predictive intelligence and analytics to enable personalization based on user profiles and past user behavior. Digital assistants can learn a user's preferences over time, provide recommendations, and even anticipate needs. In addition to monitoring data and intent, they can initiate conversations. Apple's Siri and Amazon's Alexa are examples of consumer-oriented, data-driven, predictive Chatbot.

Advanced digital assistants are also able to connect several single-purpose Chatbot under one umbrella, pull disparate information from each of them, and then combine this information to perform a task while still maintaining context—so the Chatbot doesn't become "confused."

Some common types of Chatbot include the following:

- **Scripted or quick reply Chatbot**. As the most basic Chatbot, they act as a hierarchical decision tree. These bots interact with users through predefined questions that progress until the Chatbot answers the user's question.
- **Menu-driven Chatbot**. These bots require users to make selections from a predefined list, or menu, to provide the bot with a deeper understanding of what the customer needs.
- **Keyword recognition-based Chatbot**. These Chatbot are a bit more complex; they attempt to listen to what the user types and respond accordingly using keywords from customer responses. This bot combines customizable keywords and AI to respond appropriately. Unfortunately, these Chatbot struggle with repetitive keyword use or redundant questions.
- **Hybrid Chatbot**. These Chatbot combine elements of menu-based and keyword recognition-based bots. Users can choose to have their questions answered directly or use the Chatbot's menu to make selections if keyword recognition is ineffective.
- **Contextual Chatbot**. These Chatbot are more complex than others and require a data-centric focus. They use AI and ML to remember user conversations and interactions and use these

memories to grow and improve over time. Instead of relying on keywords, these bots use what customers ask and how they ask it to provide answers and self-improve.

- **Voice-enabled Chatbot**. These Chatbot use spoken dialogue from users as input that prompts responses or creative tasks. Developers can create these Chatbot using text-to-speech and voice recognition application programming interfaces. Examples include Amazon Alexa and Apple Siri.

The future of Chatbot

Chatbot, like other AI tools, will be used to further enhance human capabilities and free humans to be more creative and innovative, spending more of their time on strategic rather than tactical activities.

In the near future, when AI is combined with the development of 5G technology, businesses, employees, and consumers are likely to enjoy enhanced Chatbot features such as faster recommendations and predictions, and easy access to high-definition video conferencing from within a conversation. These and other possibilities are in the investigative stages and will evolve quickly as internet connectivity, AI, NLP, and ML advance. Eventually, every person can have a fully functional personal assistant right in their pocket, making our world a more efficient and connected place to live and work.

Highlights of Telecom Subscription Data as on 31st July, 2024

Particulars	Wireless	Wireline	Total (Wireless+ Wireline)
Broadband Subscribers (Million)	**904.21**	**41.98**	**946.19**
Urban Telephone Subscribers (Million)	**635.46**	**32.50**	**667.96**
Net Addition in July, 2024 (Million)	0.46	0.37	0.83
Monthly Growth Rate	0.07%	1.16%	0.12%
Rural Telephone Subscribers (Million)	**534.15**	**3.06**	**537.21**
Net Addition in July, 2024 (Million)	-1.38	0.08	-1.30
Monthly Growth Rate	-0.26%	2.71%	-0.24%
Total Telephone Subscribers (Million)	**1169.61**	**35.56**	**1205.17**
Net Addition in July, 2024 (Million)	-0.92	0.45	-0.47
Monthly Growth Rate	-0.08%	1.29%	-0.04%
Overall Tele-density*(%)	**83.32%**	**2.53%**	**85.85%**
Urban Tele-density*(%)	126.93%	6.49%	133.42%
Rural Tele-density*(%)	59.14%	0.34%	59.48%
Share of Urban Subscribers	54.33%	91.39%	55.42%
Share of Rural Subscribers	45.67%	8.61%	44.58%

Data source: https://trai.gov.in/sites/default/files/PR_No.65of2024_0.pdf

Highlights of Wireless Subscriber Base State/Circle wise as on 31st July, 2024

Wireless Subscriber Base — Annexure-II

Circle	Bharti Airtel (including Tata Tele.)		Reliance Com.		Vodafone Idea		BSNL		BSNL (VNO's)		MTNL		Reliance Jio		Total		Net Addition
	Jun-24	Jul-24	Jun-24	Jul-24	Jun-24	Jul-24	Jun-24	Jul-24	Jun-24	Jul-24	Jun-24	Jul-24	Jun-24	Jul-24	Jun-24	Jul-24	
Andhra Pradesh	34108778	33,989,599	0	0	10689294	10590428	6279421	6,578,913					33070341	32978117	**84147834**	**84137057**	-10777.00
Assam	11966802	11,970,108	0	0	1523045	1510887	2976580	3,033,387					10032509	10002075	**26498936**	**26516457**	17521
Bihar	41485026	41,089,037	0	0	7651158	7591934	5201342	5,561,593					41820105	41812880	**96157631**	**96055444**	-102187
Delhi	18306388	18,301,168	0	0	16594301	16743602					1684323	1684191	20464520	20375069	**57049532**	**57104030**	54498
Gujarat	11944421	11,916,953	0	0	20379486	20319894	2679193	2,899,535					30661946	30576502	**65665046**	**65712884**	47838
Haryana	7091863	7,092,103	0	0	6717606	6684372	4055837	4,081,920					8728108	8728381	**26593414**	**26586776**	-6638
Himachal Pradesh	3595981	3,592,169	0	0	392830	388302	1513110	1,568,692					3326252	3326011	**8828173**	**8875174**	47001
J & K	6179394	6,171,783	0	0	286760	280195	778473	839,986					5170633	5252747	**12415260**	**12544711**	129451
Karnataka	32470623	32,362,339	0	0	6468809	6398322	4120157	4,300,925					24446440	24544376	**67506029**	**67605962**	99933
Kerala	8806722	8,779,707	0	0	13463485	13371728	8586971	8,605,862					11148150	11103636	**42005328**	**41860933**	-144395
Kolkata	5660644	5,604,615	0	0	5243235	5214201	1368962	1,525,975					10942648	10918837	**23215489**	**23263628**	48139
Madhya Pradesh	16303993	16,241,312	0	0	15365624	15250808	4696704	4,875,012					44122953	44298910	**80489274**	**80666042**	176768
Maharashtra	22077455	22,144,837	0	0	21905959	21727203	5676824	5,586,235					43684161	43319323	**93344399**	**92777598**	-566801
Mumbai	10141827	10,121,680	0	0	10715322	10709628					230443	227566	13248435	13150628	**34336027**	**34209502**	-126525
North East	6363875	6,313,850	0	0	725562	710298	1228962	1,245,260					4417294	4379819	**12735693**	**12649227**	-86466
Odisha	11681370	11,637,636	0	0	1398255	1397177	5326387	5,392,482					15765603	15950256	**34171615**	**34377551**	205936
Punjab	12593886	12,515,326	0	0	6411404	6360326	3714894	3,908,114					12250641	12134660	**34970825**	**34918426**	-52399
Rajasthan	23591034	23,433,054	0	0	10485204	10311213	5523352	5,567,277					27257245	27158930	**66856835**	**66470474**	-386361
Tamil Nadu	29845231	29,836,739	0	0	15450255	15333918	7,323,605	7,506,870	188,010	203,346			25921142	25669296	**78728243**	**78550169**	-178074
U.P.(E)	37400385	37,038,900	0	0	17104862	16917330	7473038	7,942,489					40853555	40871703	**102831840**	**102770422**	-61418
U.P.(W)	19004620	18,918,504	0	0	15399180	15321425	4747091	4,934,399					24691463	24686267	**63842354**	**63860595**	18241
West Bengal	18400179	18,254,778	0	0	12925151	12749686	2310124	2,558,072					24503076	24530334	**58138530**	**58092870**	-45660
Total	**389020497**	**387326197**	**0**	**0**	**217296787**	**215882877**	**85581027**	**88512998**	**188010**	**203346**	**1914766**	**1911757**	**476527220**	**475768757**	**1170528307**	**1169605932**	**-922375**
Net Addition		**-1694300**		**0**		**-1413910**		**2931971**		**15336**		**-3009**		**-758463**	0	**-922375**	
Rural Subscribers	191,133,987	189,364,577	0	0	106720671	105747489	27,158,268	28,401,681	0	0	35202	35200	210479993	210597046	**535528121**	**534145993**	**-1382128**

Data source: https://trai.gov.in/sites/default/files/PR_No.65of2024_0.pdf

2. STATEMENT OF THE PROBLEM

In light of the above, there are several researches are conducted to analyze the impact of AI powered Chatbot on consumer sentiments, service and satisfaction etc., however, there are very few researches that focus on **Why and How AI based Chatbot impacts customer satisfaction in telecom sector?**

Digital Transformation impacts everything in an increasingly digital world, businesses are adopting artificial intelligence (AI) technologies to enhance operational efficiency and customer interactions. Among these technologies, AI-driven Chatbot have emerged as a prominent tool for managing customer service and support. While these Chatbot are designed to streamline processes and provide instant responses, there is a critical need to understand their actual impact on customer satisfaction.

Despite the widespread deployment of AI-driven Chatbot, there is limited empirical research examining their effectiveness in improving customer satisfaction. Existing studies have often focused on technical performance metrics, such as response time and accuracy, without sufficiently addressing the broader implications for customer experience and satisfaction. Moreover, the rapid evolution of AI technology and variations in Chatbot implementations across different industries add complexity to the evaluation of their impact.

The problem, therefore, is to investigate how AI-driven Chatbot influence customer satisfaction. This includes exploring factors such as the quality of interactions, the efficiency of issue resolution, and the overall user experience. Understanding these dynamics is crucial for businesses to optimize their Chatbot strategies and ensure that they meet or exceed customer expectations. Addressing this gap will provide valuable insights for improving Chatbot design, deployment, and performance, ultimately enhancing customer satisfaction and loyalty.

3. REVIEW OF LITERATURE

Sr.No	Title	Authors	Year	Key Component & Scope
1	Real conversations with artificial intelligence: A comparison between human–human online conversations and human–chatbot conversations	Jennifer Hill W. Randolph Ford Ingrid G. Farreras	2015	People can transfer language skills to Chatbot, but conversation content and quality differ from human interactions.
2	Why People Use Chatbot	Petter Bae Brandtzaeg, Asbjørn Følstad	2017	Identified time and effort savings as key motivators for chatbot use.
3	"Faster Is Not Always Better: Understanding the Effect of Dynamic Response Delays in Human-Chatbot Interaction"	Ulrich Gnewuch Stefan Morana Marc Adam Alexander Maedche	2018	Moderate delays (3 and 6 seconds) enhance satisfaction and trust; longer delays (9 seconds) harm the user experience.
4	Chatbot for Customer Service: User Experience and Motivation	Asbjørn Følstad Marita Skjuve	2019	2019 Emphasized the need for quick and accurate responses to basic questions for improved user experience.
5	The Impact of Chatbot on Customer Service Performance	Alexander Rossmann Alfred Zimmermann Dieter Hertweck	2020	Chatbot superior to traditional hotlines in customer satisfaction, prices, willingness to reuse the service, referrals, and loyalty.
6	Virtual agents and flow experience: An empirical examination of AI-powered Chatbot	Abdullah M. Baabdullah Ali Abdallah Alalwan Raed Salah Algharabat Bhimaraya Metri	2022	Readability, transparency, personalization, responsiveness, and ubiquitous connection crucial for a pleasant virtual experience and improved customer satisfaction.
7	Understanding the user satisfaction and loyalty of customer service Chatbot	Chin-Lung Hsu Judy Chuan-Chuan Lin	2023	Service quality and satisfaction significantly influence chatbot user loyalty; service retrieval quality and conversational quality affect user satisfaction.
8	Study of the relationship between chatbot technology and customer experience and satisfaction	Aumaima WAHBI Karim KHADDOUJ Naoufal LAHLIMI	2023	Notably, the advantages included 24/7 accessibility, personalized interactions, cost efficiency, and versatility, while challenges encompassed technological, organizational, cultural, and trust-related issues

RESEARCH GAP:

While AI-driven Chatbot are increasingly utilized in customer service across various industries, several critical research gaps exist in understanding their impact on customer satisfaction:

Limited Empirical Evidence on Customer Experience: Existing studies often focus on technical aspects of Chatbot, such as response time and accuracy, rather than the qualitative aspects of customer experience. There is a lack of comprehensive research examining how these technical factors translate into actual customer satisfaction.

Variation in Chatbot Implementations: Chatbot are implemented in diverse ways across different sectors and companies, leading to variability in their effectiveness. There is a need for research that explores how different design and implementation strategies impact customer satisfaction, taking into account industry-specific contexts.

Customer Perception and Interaction Quality: While technical efficiency is commonly measured, the quality of interactions—such as the Chatbot's ability to understand context, handle complex queries, and provide empathetic responses—is less studied. Research is needed to understand how these factors influence overall customer satisfaction.

Longitudinal Impact on Customer Loyalty: Much of the current research focuses on immediate customer reactions rather than the long-term impact of Chatbot interactions on customer loyalty and retention. There is a gap in understanding how sustained use of AI-driven Chatbot affects customer relationships over time.

Comparative Analysis with Human Agents: There is insufficient research comparing the satisfaction levels of customers interacting with AI-driven Chatbot versus human agents. Such comparisons are essential to evaluate whether Chatbot can match or exceed the satisfaction typically associated with human interactions.

Cultural and Demographic Differences: Research often overlooks how cultural and demographic factors influence customer satisfaction with AI-driven Chatbot. Understanding how different customer segments respond to Chatbot interactions is crucial for tailoring solutions to diverse user needs.

Impact of Chatbot Personality and Language: The role of Chatbot personality, tone, and language in influencing customer satisfaction has not been thoroughly explored. Investigating how these elements affect customer perceptions and interactions can provide insights into creating more effective Chatbot.

Addressing these research gaps will provide a more nuanced understanding of the impact of AI-driven Chatbot on customer satisfaction, helping businesses optimize their Chatbot strategies to better meet customer needs and enhance overall service quality.

4. OBJECTIVES OF STUDY

1. To understand the **effectiveness** of AI chat-bots while handling customer enquiries as compared to traditional customer service in the Telecom Industry.

2. To identify how different **demographic groups perceive and interact** with AI Chatbot, including variations in satisfaction levels based on age, tech-savviness, or previous experiences with digital tools.

3. To ascertain how **interactions** with AI Chatbot **influence customer loyalty and retention**, including whether positive or negative experiences affect customers' likelihood to continue using a service or product.

4. To examine the **level of satisfaction** among consumers who interact with AI Chatbot, including factors such as ease of use, the quality of responses, and the overall user experience.

5. To specify the **various challenges** associated in usage and implementation of the AI Chatbot

6. To assess the **long-term effects** of AI Chatbot implementation on **overall customer service quality and business outcomes**, including potential shifts in customer expectations and behavior over time.

5. RESEARCH METHODLOGY

1) Research Design: Research refers to the systematic method consisting of enunciating the problem, formulating a hypothesis, collecting the facts or data, analyzing the facts and reaching certain conclusions either in the form of solutions towards the concerned problem or in certain generalizations for some theoretical formulation. The study is descriptive in nature, thus it follows descriptive research design because it studies the satisfaction of respondents on AI based Chatbot's by collecting their profile

2) Data Collection: Both primary and secondary data collection methods will be used.

a) Primary data collection method and structured questionnaire will be used and data collection techniques will assist to bring the real insight to understand the research problem at various levels Quantitative type of research will be applied by using the questionnaire, testing on a population of Mumbai Metropolitian Region. Hence, the primary data on dependent and independent variables will be collected.

b) Secondary data will be collected from allied sources like internet, newspapers, reference books, etc.

3) Questionnaire Design: The questionnaire will be designed by using both measurement and rating scales. The measurement scales include nominal scale, ordinal scale and interval scale.
Nominal scale will be used to understand the profile of the respondents like age, experience, marital status, education, gender, etc.
Ordinal scale is a ranking scale used to rank the attributes for ease of use (Very Easy, Easy, Neutral, Difficult, Very Difficult).
Interval scale is used as an attitude measurement scale on 1 -5, 1 = Very Dissatisfied to 5 = Very Satisfied. In this study, interval scale is used to determine the impact of AI based chat bots on customer satisfaction.
Likert rating scale is used as a rating scale used to indicate the agreement or disagreement on a series of statements related to customer experience, RATER model of customer satisfaction, etc on 1 – 5, 1 being Strongly disagree and 5 being Strongly agree.

4) Sample Design:

Sr. No.		Description
1	**Type of Industry**	Telecom
2	**Population Size**	Total population using Telecom Services in Mumbai Metropolitian Region
3	**Sample Size**	1000
4	**Units of Observation**	Telecom service users / customers
5	**Method of Sampling**	Convenience and Quota
6	**Sampling Technique**	Non-Probabilistic

5) Statistical Tools

The following statistical tools will be used to study the impact of AI-Driven Chat-bots on Customer Satisfaction with special reference to telecom service providers in Mumbai Metropolitian Region (MMR) like

1) **Chi-Square Test:**

It is called as goodness-of-fit test. It is used to test how observed frequencies differ from expected frequencies. It is useful in determining if there is a significant association between two categorical variables. Chi-Square test between two variables will help to find out the symmetric association between the variables.

2) **Pearson Correlation:**

It is a bivariate analysis which is used to determine the degree of association between the variables. It is also used to determine the strength and relationship between the variables. It is denoted by r called as Karl Pearson Correlation Coefficient. The value of ranges r from +1 to - 1[+1 indicates positive correlation, -1 indicates negative correlation]. If the value of r is between [0.75 to 1 (itis high association), 0.5 to 0.74 (moderate association), less than 0.5 (low association)].

3) **Multiple Regression Analysis:**

It will help to test the effect of independent variables on dependent variable. This allows researchers to assess the strength of the relationship between an outcome (the dependent variable) and several predicting variables as well as the importance of each of the predictors to the relationship, often with the effect of other predictors statistically eliminated.

4) **Factor Analysis:**

It is a multi-variate analysis which will help to test the variables simultaneously. It is used in data reduction and data summarization as commonalities in the variables are eliminated to form smaller number of factors.

5) **Reliability Analysis:**

It will help to test the internal consistency among the variables. Cronbach's alpha is a very common tool used to test reliability or consistency of the data collected under study.

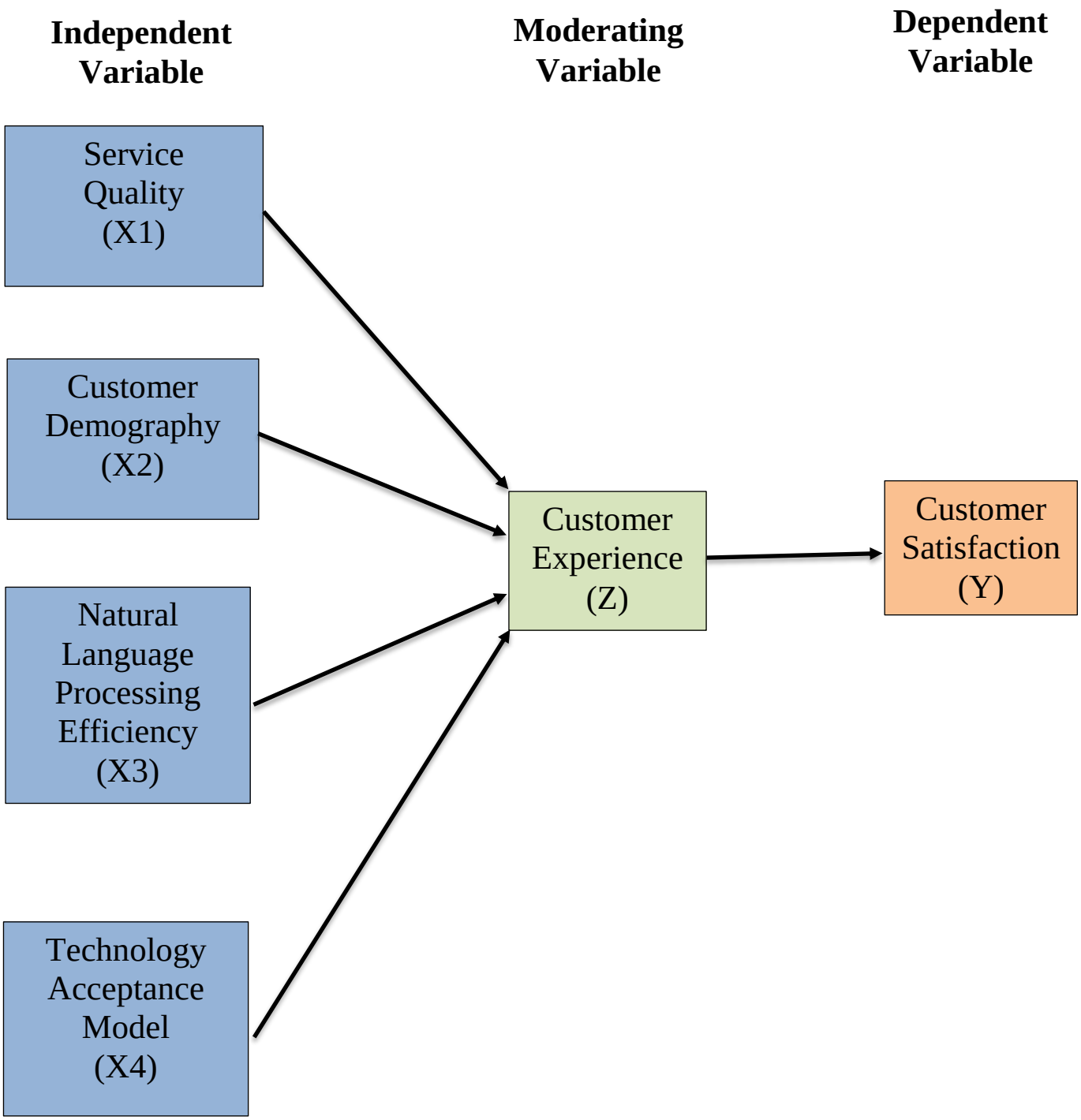
6) **Structural Equation Modeling (SEM):**

It will help to test the equations of multiple regressions simultaneously.

7) **Simple Percentage Method:**

It will help where a percentage is used to determine relationship between the data series.

Research Variables (Theoretical Framework)



Independent Variables

1) Service Quality(X1)

This includes aspects such as reliability, responsiveness, assurance, empathy, and tangibles. How well the service meets or exceeds customer expectations is a major determinant of satisfaction.

Components of Service Quality:

a. **Reliability**: It denotes the firm's consistency in providing services to satisfy the needs of its customers
b. **Assurance**: It measures the ability of service providers to relay trust to the customers which are paramount in getting confidence in customers to stick with the organization.
c. **Tangibility**: Tangibility is a service quality dimension that measures how the organization presents the quality of its services to customers.
d. **Empathy**: Understanding the consumer's use case, how the product will be useful to them, guiding them and helping them achieve their goals, and being empathetic to their needs is a very important process for an organization
e. **Responsiveness**: Willingness to help customers and provide prompt service.

2) Customer Demography(X2):

The influence of demographic factors (such as age, tech-savviness, and preferences) on how different customer segments interact with and perceive the Chatbot. Different demographics may experience varying levels of satisfaction.

Components of Customer Demography

a. **Age**
b. **Gender**
c. **Education**
d. **Marital Status**
e. **Location**
f. **Occupation**
g. **Employment Status**

3) Natural Language Processing (NLP) Efficiency (X3):

NPS for customer service holds an important role in understanding customer satisfaction levels. But apart from that, it also gives great insights into business growth. Understanding this importance is essential for companies aiming to thrive in today's competitive landscape

Components of NLP

a. **Customer retention and loyalty**
b. **Customer perception**
c. **Customer churn**
d. **Monitor organization, product or service improvements**

4) Technology Acceptance Model (X4):

The technology acceptance model (TAM) was first proposed in 1989 by Davis (1989) and Davis et al. (1989) as an instrument to predict the likelihood of adopting a new technology within a group or an

organization. Originating in the psychological theory of reasoned action and theory of planned behavior (TPB), TAM has evolved to become one of the key models used in understanding predictors of human behavior toward potential acceptance or rejection of the innovative technology (Turner et al., 2010).

Components of TAM

a. **Perceived ease of use (PEU)**: it is a measure as the degree to which a user believes that using a particular system would be effort-free? / How easy the technology is to use?
b. **Perceived usefulness (PU)**: it is a measure as the degree to which a user believes that using a specific system would enhance the job performance. / How much the technology improves job performance?
c. **Attitude toward use (ATU)**: A person's overall evaluation of the technology.
d. **Behavioral intention to use (BI**) / Intentions to use technology: It is determined by a person's attitudes toward technology.

Moderating Variables

Customer Service Experience: The prior experience customers have with customer service, whether positive or negative, can influence how they perceive the Chatbot. Those with negative past experiences might be more critical of Chatbot interactions.

Customer Familiarity with Technology: The level of a customer's familiarity with AI and Chatbot can moderate how they perceive and interact with the technology. More tech-savvy customers might have a different experience compared to those less familiar with digital tools.

Nature of the Query or Issue: The complexity of the customer's query or issue can affect how well the Chatbot performs and, consequently, the level of satisfaction. Simple inquiries might be handled effectively by Chatbot, while more complex issues might require human intervention.

Chatbot Design and Usability: The design and usability of the Chatbot interface can moderate its effectiveness. Well-designed Chatbot with user-friendly interfaces are likely to lead to higher satisfaction, whereas poorly designed ones might detract from the experience.

Personalization Level: The extent to which the Chatbot personalizes interactions based on customer data can moderate satisfaction. High levels of personalization might enhance the experience, while generic responses might lead to lower satisfaction.

Response Quality: The overall quality of responses provided by the Chatbot, including accuracy, relevance, and helpfulness, can moderate the relationship between Chatbot interactions and customer satisfaction.

Dependent Variable

Customer Satisfaction (Y): Effective implementation of AI based chatbots with consistent upgradation of natural language processing and machine learning along with uniformity in the Chatbot's responses and behavior with consistent performance will build trust and improve customer satisfaction.

6. HYPOTHESIS OF STUDY

1. **Objective No 1**: To understand the **effectiveness** of AI chat-bots while handling customer enquiries as compared to traditional customer service in the Telecom Industry.

   Hypothesis 1: AI Chatbot improve response time (reduce wait time) compared to human agents.

   $H1_0$: There is no significant impact on response time by using AI chatbot as compared to human agents.

   $H1_A$: There is a significant impact on response time by using AI chatbot as compared to human agents.

   Hypothesis 2: Consumers who interact with AI Chatbot report higher satisfaction levels compared to human agents.

   $H2_0$: There is no significant influence on customer satisfaction by using AI chatbot as compared to human agents.

   $H2_A$: There is a significant influence on customer satisfaction by using AI chatbot as compared to human agents.

2. **Objective No 2**: To identify how different **demographic groups perceive and interact** with AI Chatbot, including variations in satisfaction levels based on age, tech-savviness, or previous experiences with digital tools.

   Hypothesis 3: The demographic profile of consumers influences their satisfaction with AI Chatbot, with younger, tech-savvy individuals reporting higher satisfaction compared to older or less tech-savvy individuals.

   $H3_0$: There is no significant influence of demography on customer satisfaction by using AI chatbot.

   $H3_A$: There is a significant influence of demography on customer satisfaction by using AI chatbot.

3. **<u>Objective No 3</u>**: To ascertain how **interactions** with AI Chatbot **influence customer loyalty and retention**, including whether positive or negative experiences affect customers' likelihood to continue using a service or product.

   Hypothesis 4: Consumers who interact with AI Chatbot have a lower level of satisfaction compared to those who interact with human agents, especially for complex or nuanced issues.

   $H4_0$: There is no significant influence on customer satisfaction by AI chatbot as compared to human agents for complex queries.

   $H4_A$: There is a significant influence on customer satisfaction by AI chatbot as compared to human agents for complex queries.

   Hypothesis 5: Customer satisfaction with AI Chatbot is positively correlated with the Chatbot's ability to understand and process natural language effectively.

   $H5_0$: There is no strong association between the Chatbot's ability to understand and process natural language effectively with customer satisfaction.

   $H5_A$: There is a strong association correlation between the Chatbot's ability to understand and process natural language effectively with customer satisfaction.

4. **<u>Objective No 4</u>**: To examine the **level of satisfaction** among consumers who interact with AI Chatbot, including factors such as ease of use, the quality of responses, and the overall user experience.

   Hypothesis 6: Frequent users of AI Chatbot experience less frustration and higher satisfaction over time as they become more familiar with the technology.

   $H6_0$: There is no significant influence of frequency of usage of AI chatbots on customer satisfaction.

   $H6_A$: There is a significant influence of frequency of usage of AI chatbots on customer satisfaction.

These hypotheses provide a basis for exploring various aspects of AI Chatbot' impact on consumer service and satisfaction and can be tested through surveys, experiments, or data analysis.

7. SIGNIFICANCE OF STUDY

Since AI is still in the evolving/developing phase similar is the case with AI based chatbots. The study on the impact of AI-driven Chatbot on customer satisfaction holds substantial significance for multiple stakeholders, including businesses, customers, and the broader field of AI and customer service. Here's how:

1. **For Businesses**:

   Enhanced Customer Experience: Understanding how AI-driven Chatbot impact customer satisfaction can help businesses tailor their Chatbot designs to better meet customer needs, leading to improved customer experiences and higher satisfaction levels.

   Operational Efficiency: Insights from the study can guide businesses in optimizing their Chatbot implementations, resulting in more efficient customer service operations, reduced operational costs, and better resource allocation.

   Competitive Advantage: By identifying best practices and effective strategies, businesses can leverage Chatbot as a competitive differentiator, enhancing their market position and customer loyalty.

2. **For Customers**:

   Improved Service Quality: The study's findings can lead to the development of more effective Chatbot that provide quicker, more accurate, and more empathetic responses, thereby improving overall customer satisfaction and engagement.

   Enhanced User Experience: A deeper understanding of what makes Chatbot interactions satisfactory can contribute to designing more user-friendly and intuitive Chatbot, leading to a more positive and efficient customer service experience.

3. **For AI and Technology Development**:

   Informed AI Development: Insights from the study can drive advancements in AI technologies, particularly in areas such as natural language processing, machine learning, and conversational design, by highlighting the aspects that significantly impact customer satisfaction.

   Benchmarking and Standards: The research can help establish benchmarks and best practices for AI-driven Chatbot, contributing to the development of industry standards and guidelines for designing and deploying effective Chatbot solutions.

4. **For Academia and Research**:

   Expanding Knowledge: The study will contribute to the academic literature by providing empirical evidence on the relationship between AI-driven Chatbot and customer satisfaction, addressing existing research gaps and informing future studies.

   Theoretical Contributions: It can also contribute to theoretical frameworks related to customer service, AI interaction, and satisfaction measurement, enhancing the understanding of these concepts in both practical and academic contexts.

5. **For Policy Makers**:

   Guidance on Regulation: Findings from the study could provide valuable insights for policymakers involved in regulating AI technologies and customer service practices, helping to ensure that Chatbot implementations meet high standards of service quality and customer protection.

In summary, this study is significant because it offers actionable insights that can lead to improved Chatbot design and deployment, enhancing customer satisfaction and operational efficiency. It also contributes to the broader understanding of AI applications in customer service, fostering advancements in technology and theory while informing business practices and policy development.

8. SCOPE OF STUDY

The scope of this study on the impact of AI-driven Chatbot on customer satisfaction will encompass the following dimensions:

Functionality: The study will examine various types of AI-driven Chatbot, including rule-based Chatbot, machine learning-based Chatbot, and hybrid models.

Customer Interaction Contexts: Post-Sales Support: The study will assess Chatbot interactions post-sales (e.g., issue resolution, feedback collection) contexts.

Customer Support Channels: The research will cover Chatbot used across various channels, including websites, mobile apps, and social media platforms.

Cost Benefit Analysis: The research will study the cost & benefit aspect of the AI chatbots over the human agents while delivering the services.

Customer Satisfaction Metrics:

- **Quantitative Metrics:** The study will evaluate quantitative measures of customer satisfaction, such as response time, resolution time, and accuracy of information provided by Chatbot.
- **Qualitative Metrics:** It will also assess qualitative aspects such as user experience, conversational quality, and perceived empathy of the Chatbot.

Comparative Analysis:

- **Human vs. AI Interactions:** The research will include a comparative analysis of customer satisfaction between interactions with AI-driven Chatbot and human customer service agents.

Customer Demographics and Psychographics:

- **Demographic Factors:** The study will explore how factors such as age, gender, and geographic location influence customer satisfaction with Chatbot.
- **Psychographic Factors:** It will investigate how customer attitudes, preferences, and technological comfort levels affect their satisfaction with AI-driven Chatbot.

Technological and Design Features:

- **Chatbot Design:** The research will examine how design elements like Chatbot personality, conversational style, and interface impact customer satisfaction.
- **Technology Utilization:** The study will consider how advancements in AI technologies, such as natural language processing (NLP) and machine learning, contribute to customer satisfaction.

Temporal Dimension:

- **Short-Term vs. Long-Term Satisfaction**: The research will explore both short-term satisfaction immediately following interactions and long-term satisfaction related to ongoing customer relationships with Chatbot.

By focusing on these dimensions, the study aims to provide a comprehensive understanding of how AI-driven Chatbot affect customer satisfaction, offering insights for businesses to optimize their Chatbot implementations and improve overall customer service quality.

9. LIMITATIONS OF STUDY

Limited Sample Scope: The study may be constrained by a limited sample size or lack of diversity, which could affect the generalizability of the findings. If the sample does not adequately represent different demographics, industries, or regions, the results may not be universally applicable.

Different Technologies and Designs: AI-driven Chatbot vary widely in terms of technology, design, and functionality. This variability can make it challenging to draw consistent conclusions across different implementations or to compare results meaningfully.

Rapid Technological Changes: The field of AI is rapidly evolving, and the technologies or methods used in Chatbot may change during the course of the study. This dynamic nature could impact the relevance of the findings over time.

Perception Variability: Customer satisfaction is inherently subjective and can be influenced by individual preferences, expectations, and experiences. This subjectivity can make it difficult to measure and compare satisfaction levels consistently.

Self-Reported Data: If customer satisfaction data is collected through surveys or self-reports, there may be biases such as social desirability or recall bias affecting the accuracy of the results.

Short-Term Focus: The study may primarily focus on short-term interactions and immediate customer reactions, potentially overlooking long-term impacts on customer satisfaction and loyalty.

Lack of Cultural Sensitivity: The study may not fully account for cultural and regional differences in how customers perceive and interact with AI-driven Chatbot, which could affect the generalizability of the findings across different cultural contexts.

Acknowledging these limitations is crucial for interpreting the study's findings accurately and for guiding future research. Addressing these limitations through careful study design, diverse sampling, and robust data collection methods can help enhance the validity and applicability of the research outcomes.

10. TENTATIVE CONCLUSION

Based on the research conducted on the impact of AI-driven Chatbot on customer satisfaction, several preliminary conclusions can be drawn:

Overall Positive Impact: AI-driven Chatbot generally have a positive impact on customer satisfaction by providing timely and efficient responses. Customers appreciate the speed and availability of Chatbot, which can lead to improved satisfaction, particularly in scenarios requiring quick resolutions.

Variable Effectiveness: The effectiveness of AI-driven Chatbot in enhancing customer satisfaction varies depending on several factors, including the complexity of queries, the quality of the Chatbot's design, and its ability to understand and process natural language. Chatbot that integrate advanced natural language processing (NLP) and machine learning techniques tend to perform better in delivering satisfactory interactions.

Role of Human-Like Interaction: Chatbot that exhibit more human-like interactions—such as understanding context, demonstrating empathy, and engaging in personalized communication—are associated with higher levels of customer satisfaction. Conversely, Chatbot that offer generic or overly mechanical responses may not meet customer expectations.

Short-Term vs. Long-Term Effects: While AI-driven Chatbot often improve short-term satisfaction by resolving issues quickly, their long-term impact on customer loyalty and retention requires further investigation. Sustained positive interactions and effective follow-ups are crucial for maintaining long-term customer satisfaction.

Diverse Customer Expectations: Customer satisfaction with AI-driven Chatbot is influenced by demographic and psychographic factors. Different customer segments have varying expectations and preferences regarding Chatbot interactions, indicating the need for tailored Chatbot solutions to address diverse user needs.

Comparative Performance with Human Agents: The study reveals that while Chatbot can handle routine and straightforward queries effectively, human agents are still preferred for complex or sensitive interactions. A hybrid approach combining AI Chatbot for routine tasks and human agents for more nuanced issues may offer the most comprehensive solution.

Recommendations for Improvement: To enhance customer satisfaction, businesses should focus on continuous improvement of Chatbot design, incorporating feedback from users, and investing in advanced AI technologies. Additionally, integrating Chatbot with human support systems can provide a more balanced and effective customer service experience.

In summary, AI-driven Chatbot hold significant potential to enhance customer satisfaction through improved efficiency and accessibility. However, their effectiveness is contingent upon various factors, including the quality of AI technologies, the complexity of customer interactions, and industry-specific needs. Further research is needed to explore the long-term impacts and to refine strategies for integrating Chatbot into broader customer service frameworks.

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